SCIENCE AND RELIGION

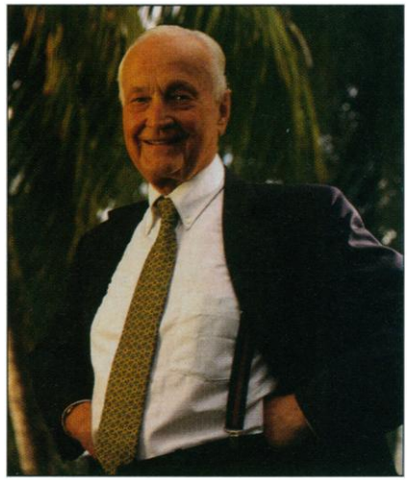
Subjecting Belief to the Scientific Method

A stock tycoon hopes to train scientific inquiry on the mind of God; so far, he has generated a lot of publicity

Chimpanzees squabble over mates, over food, over, well, you name it. But do they forgive their erstwhile foes—or harbor grudges? That's what primatologist Frans de Waal of the Yerkes Regional Primate Research Center in Atlanta aims to find out. He's training 20 chimps to operate joysticks that will allow them to scroll through a gallery of mug shots of their companions. De Waal hopes to open a window into the minds of his wards by observing chimp facial expressions and other behaviors before and after fights. The goal, he says, is "to see how long they remember a fight and how emotionally charged is the memory, and how the memory is affected by reconciliation."

If you guessed this 3-year project is not sponsored by the National Science Foundation, you are correct. Bankrolling the provocative research is the John Templeton Foundation and its $10 million "campaign for forgiveness research." Riding a wave of publicity it has received over the past year or so, the 12-year-old organization is going full throttle to yoke science to its mission of breathing new life into religion and ethics. The foundation, based in Radnor, Pennsylvania, is waging its crusade on multiple fronts: staging conferences (see sidebar), offering prizes, designing courses, churning out books, and funding research such as de Waal's as well as a program on science and religion at the American Association for the Advancement of Science (AAAS), which publishes *Science*. "If spiritual information doesn't begin to speed up, all religions will become obsolete," Sir John Templeton, the foundation's prime mover and wellspring of funds, told *Science*. With a war chest of $800 million, Templeton has, in essence, set out to do nothing less than accelerate the evolution of religion.

The foundation's goal, in its own words, is to "encourage ... worldwide explorations of the moral and spiritual dimensions of the universe and of the human potential within its ultimate purpose." According to director Charles Harper, a planetary scientist formerly at Harvard University, scientists must play a central role in this exercise for there to be a "rapprochement" between science and religion. One prominent Templeton grantee says he has no reservations about the foundation or its philosophy. "I think they're great, and I'm a grouchy atheist," says Stanford primate researcher Robert Sapolsky. "I have detected no hidden agenda in the way they function."



Man on a mission. Sir John Templeton says bringing hard-core science to theology could prevent religions from becoming "obsolete."

To some critics, however, Templeton's agenda is futile, if not deceptive. "All this activity creates a flurry of illusion that science and religion are finding common ground. In fact, I think nothing in particular is happening," says physicist Stephen Weinberg, an atheist who has debated religious scientists at Templeton-sponsored symposia. "They want to have a kind of friendly reunion of scientific and religious intellectuals, which can reestablish religion as something with a higher degree of intellectual respectability than it has among most scientists," says Weinberg, who opposes this goal.

Other scientists have mixed feelings about the Templeton-led science-and-religion mind meld. Biologist Ursula Goodenough of Washington University in St. Louis, for one, complains that the dialogue the foundation promotes sometimes appears as an effort to prove that God exists. She points to an essay contest on "expanding humanity's vision of God," which, she notes, encourages contestants to muster scientific evidence for a creator. But Goodenough says she approves of many other foundation activities that "really do seem open-minded and genuinely devoted to addressing real questions that aren't being addressed in any other forum."

Before embarking on his crusade to get scientists and theologians talking to each other, the Tennessee-born Templeton, now 86, amassed a fortune as an investment counselor and Wall Street wizard who founded the Templeton Growth Fund. In 1972 the former Rhodes scholar established the annual Templeton Prize for Progress in Religion, worth $1.3 million this year, awarded to someone deemed to have shown "extraordinary originality" in advancing understanding of spirituality.

Thinking even bigger, in 1987 Templeton, a knighted British citizen, started the Templeton Foundation, which he oversees from the Bahamas with the help of a global network of advisers—mostly scientists, theologians, and business leaders—that includes former Treasury Secretary William Simon and historian Gertrude Himmelfarb, professor emeritus at City University of New York. Although a few of the several dozen advisers are Moslem, most are Christian.

But that doesn't stop Templeton, a Presbyterian and self-proclaimed "enthusiastic Christian," from prescribing an antidote for what he

THE PRICE OF FORGIVENESS
(SELECTED TEMPLETON FOUNDATION PROJECTS)

Researcher	Institution	Subject	Funding
Audrey Chapman	AAAS	South Africa's Truth and Reconciliation Commission	$300,000
Ervin Staub	University of Massachusetts, Amherst	Forgiveness in civil war–torn Rwanda	$232,092
Lindon Eaves	Virginia Commonwealth University	Whether forgiveness protects against drug abuse	$200,000
Pietro Pietrini	National Institute of Neurological Disorders and Stroke	Imaging brain activity in forgiving people	$125,000
Lee Dugatkin	University of Louisville	Evolutionary and Judaic approaches to forgiving behavior	$62,757

CREDITS: (TOP TO BOTTOM) A. STATES/SABA; THE TEMPLETON FOUNDATION

Searching for Answers to Cosmic Questions

The laws of nature are "cold and impersonal," pronounces physicist Steven Weinberg. The world is "shot through with signs of mind," counters physicist John Polkinghorne. Debate of this kind is not standard fare for your average scientific conference—unless it's one sponsored by the John Templeton Foundation (see main text). The organization has trotted out this polarized pair—atheist Weinberg, a professor at the University of Texas, Austin, and Anglican priest Polkinghorne, former president of Queens College at Cambridge University—at several fora across the country, including "Cosmic Questions," an event held last month at the Smithsonian Institution in Washington, D.C., and co-sponsored by the American Association for the Advancement of Science (AAAS).

Weinberg versus Polkinghorne makes for good theater, but the conference had a deeper purpose. The idea was to bring scientists and theologians together to air their views on three mind-numbing questions: "Did the universe have a beginning?" "Was the universe designed?" and "Are we alone?" Some scientists say the time is ripe to seek out common ground. "A new scientific cosmology is emerging today," said physicist Joel Primack of the University of California, Santa Cruz, who illustrated this notion with a thrilling computerized plunge through the Hubble Space Telescope's deep field, carrying viewers back 15 billion years, nearly to the birth of our universe. Indeed, said physicist Robert John Russell, a minister of the United Church of Christ and founder of the Center for Theology and the Natural Sciences at the University of California, Berkeley, "it's very important [for theologians] to take the big bang seriously."

Out there somewhere? At a AAAS conference last month, theologians and some scientists saw the hand of God—depicted above by 17th century Italian painter Guercino—in the beginning of the universe.

At the conference, participants circled around a concept providing a Venn diagram–like overlap between science and religion. Called the "anthropic principle," in its simplest form it states, in the words of physicist Frank Tipler of Tulane University in New Orleans, that "the observed properties of the universe are consistent with human life evolving in it." That is, if the basic physical constants—such as gravity or an electron's mass—were the slightest bit off, life could not exist. If gravity were stronger, matter would have collapsed in on itself; weaker, and matter would have pulled apart too fast to coalesce. Both the universe's "intelligibility" (it follows laws of science) and its "suitability" for life are evidence of the hand of God, argued Anna Case-Winters, a professor of theology at McCormick Theological Seminary in Chicago.

More than a few scientists, however, dismiss the principle: You can't talk about odds-defying circumstances when you have a sample of only one universe, noted physicist Alan Guth of the Massachusetts Institute of Technology. All you can say is "If it did happen, it could happen." Indeed, some scientists think science has little to gain from such "Cosmic Questions" exercises. According to paleobiologist Stephen Stanley of Johns Hopkins University, applying theology to ethical debates in science—one obvious mechanism for bringing about a science-religion encounter—"will simply complicate an already complex issue."

Organizers see things differently. "The major accomplishment of the conference was to contribute to greater understanding across disciplinary boundaries," says Audrey Chapman, who heads the AAAS's 3-year-old Dialogue Between Science, Ethics, and Religion, which has a 5-year, $1.3 million grant from the Templeton Foundation. A dialogue, at least, can't hurt, says Guth. "Much of the brainpower that has been thrown at ethical questions in science has come from theologians," he says, "so it is good for scientists to stay in touch." **–C.H.**

sees as ailing religion in general. Whereas science has progressed rapidly, religions "resist ... new concepts," Templeton says. He believes religion would benefit by following the scientific model. After all, he says, "scientists who study total world information say it doubles every 3 years. Chances are that spiritual information"—insights into how to forgive or be virtuous, for example—"has only doubled since the time of Christ." Templeton rarely passes up an opportunity to disseminate such information, through books and "law of life" aphorisms posted daily at the foundation's Web site (sample: "Reverse the word evil and you have the word live.")

As part of his effort to reach out to the scientific community, Templeton has built a close relationship with the 18-year-old Center for Theology and the Natural Sciences at the University of California, Berkeley. Last year the foundation gave the center $12 million to run a program aimed at developing academic courses on science and religion. Another Templeton-backed center activity was a conference last June on "Science and the Spiritual Quest." Some people complained that the roster was stacked, as all scientist-speakers were believers; organizers say that was just the point. The conference catapulted the subject to national prominence—*Newsweek* ran a cover story entitled "Have Scientists Discovered God?" Indeed, anywhere there's a God-and-science splash, Templeton is likely to be behind the scenes. Last fall's PBS program on "Faith and Reason," for example, counted Templeton as a major sponsor.

As the foundation enjoys a rising profile, it is making friends among scientists. Last year it doled out $40 million, more than half of which went to "scientists who are trying to use science as a method to discover more spiritual information," Templeton says. A centerpiece of this effort is a program that sponsors 60 projects investigating forgiveness and reconciliation in animal populations, families, tribes, and other groups (see table). Another thrust is "spirituality and healing," including a project led by Harvard's Herbert Benson on whether "intercessory prayer" helps sick people get well (*Science*, 18 April 1997, p. 357). Some foundation-sponsored work has started to find its way into peer-reviewed journals: For example, a Duke University team reported last October in the *Southern Medical Journal* that frequent churchgoers had fewer and shorter hospital stays than nonchurchgoers.

Some scientists contend that all this research is generating more hot air than light and belittle Templeton's quest for evidence of a creator. It's "not only unscientific, it is antiscientific" to posit any force other than the laws of physics behind the universe's creation, says Robert Park of the American Physical Society. Others are concerned over how the foundation picks conference speakers. Good-enough cites a lack of balance, she says, in a Templeton-supported lecture series, which at Gonzaga University in Spokane, Washington, last spring featured science historian Stephen Meyer, a prominent advocate of "intelligent design." That term, says Harper, is associated with "neocreationists"—Christians who neither defend the biblical account of creation nor fully embrace evolution. Harper, a Christian who says he believes in a "purposive or-

CREDIT: ALINARI/ART RESOURCE, NY

der" to the universe, defends giving Meyer a platform. Although Harper says he and his colleagues at the Templeton Foundation don't buy intelligent design, they also don't believe in "blacklisting scholars based on their points of view."

When it comes to research, no one seems to have qualms over how the foundation spends its money—least of all the recipients. A symposium last month on "the biology of belief and trust" "wouldn't have been supported" if the foundation did not exist, says organizer Randolph Nesse, an evolutionary psychologist at the University of Michigan, Ann Arbor, the symposium's venue. The meeting explored how "relationships based on trust" evolve, says Nesse, which is related to how societies adopt moral codes and religion. It's all right by him if the foundation wants everyone to believe God created the universe, Nesse says—Templeton didn't ask him to purvey that message when it gave him $20,000 for the symposium.

University of California, Irvine, biologist Francisco Ayala, an ordained priest who is a foundation adviser as well as head of the AAAS religion program's advisory board, backs what he calls Templeton's "idealistic" goal of "understanding God and spirituality through science." Templeton says he expects "100-fold more spiritual information within a century or two"—a goal Ayala calls "naïve." After all, accumulating religious insights may be a bit harder than growing a mutual fund—barring a miracle, that is.

—CONSTANCE HOLDEN

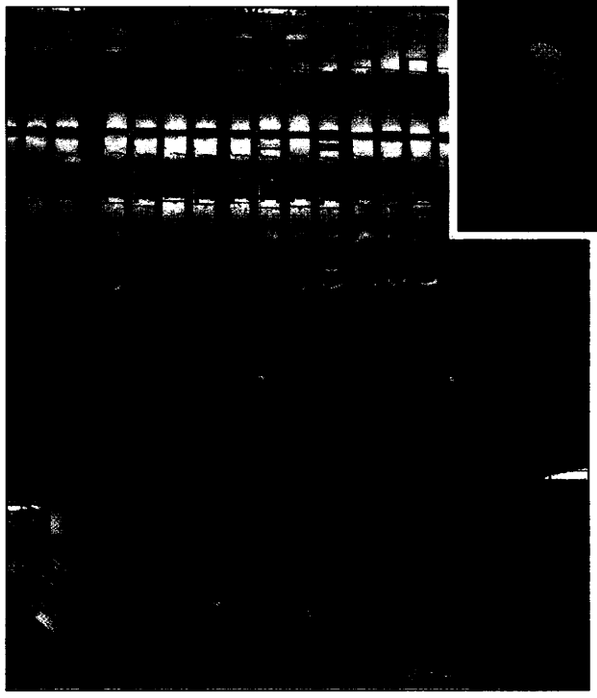
NUCLEAR PROLIFERATION

U.S. Sanctions Block People But Not Goods From India

A U.S. ban on exports of sensitive weapons material also prevents some Indian scientists from visiting some U.S. civilian labs

MUMBAI AND WASHINGTON, D.C.—One year after India conducted nuclear tests that triggered new U.S. sanctions against dozens of research institutions affiliated with the country's defense sector, it's business as usual for a few U.S. companies buying products and other technology from blacklisted institutions. The deals—covering equipment to monitor power plants and technology to interact with communications satellites—are possible because the sanctions prohibit U.S. exports, but not imports, of technology.

Although hailed by Indian officials as proof of their scientific prowess, the transactions are conducted under rules that scientists from both countries say often defy logic. Those who developed the technology can't travel to the United States to install the equipment, for example, and anything that needs to be repaired can't be sent back because it would violate U.S. export restrictions. And the one-way technology flow also threatens long-standing civilian collaborations that scientists say have nothing to do with nuclear weapons.



Zero tolerance. Part of the D0 experiment team at Fermilab, which is off limits to Indian collaborators from TIFR, headed by S. S. Jha (*inset*).

CREDITS: (LEFT TO RIGHT) FERMILAB VISUAL MEDIA SERVICES; P. BAGLA

The latest U.S. sanctions, imposed last summer, are meant to deprive India of material and knowledge that might advance its nuclear weapons or ballistic missile program. (The sanctions also apply to Pakistan, which conducted its own tests last year in response to India's actions, but there are fewer U.S.-Pakistani scientific interactions.) At their core is a ban on visits to the United States by scientists working at more than 60 institutions, including India's civilian nuclear centers, fundamental science institutes, and its space agency. Visits by U.S. scientists to these institutes are also barred. "We want to limit the threat to U.S. security" from foreign scientists who might bring home information gleaned from their visits, says a spokesperson for the Commerce Department, which enforces the sanctions. "We don't mind learning their secrets, but we don't want to share ours."

U.S. officials say the sanctions could be lifted if India shows a greater commitment to arms control by ratifying the Comprehensive Test Ban Treaty and an agreement on the control of fissile materials. In the meantime, the Department of Energy (DOE) is pressing the State Department for an immediate change in its current policy. Instead of issuing a blanket denial on visa requests by scientists from a blacklisted institution, say DOE officials, immigration officers should examine each request on its merits. The proposal, under review by Energy Secretary Bill Richardson, would also need State Department approval before going out as a policy directive to embassy staffs.

Such a change in policy might yield an immediate payoff for an international collaboration of high-energy physicists working at the Fermi National Accelerator Laboratory (Fermilab) in Batavia, Illinois. The team—450 scientists from 13 countries, including India—is spending $40 million to upgrade a five-story-high detector, called D0, for an experiment due to start late next year on the Tevatron, the world's most powerful proton accelerator. In March 1998, Indian scientists from the Tata Institute of Fundamental Research (TIFR) in Mumbai shipped their contribution, a $500,000 scintillation counter and shield to block out cosmic rays from the outside and to identify muon particles generated in the collision of experimental particles.

The D0 team is beginning to assemble and test the various parts of the massive detector. Under normal circumstances, that would prompt a visit by four or five senior scientists from TIFR to oversee the installa-